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## **FEDERAL COMMUNICATIONS COMMISSION**

### **47 CFR part 15**

**[ET Docket No. 18-295, GN Docket No. 17-183; FCC 18-147]**

#### **Unlicensed Use of the 6 GHz Band**

**AGENCY:** Federal Communications Commission.

**ACTION:** Proposed rule.

**SUMMARY:** In this document, the Commission proposes to expand unlicensed use of the 5.925-7.125 GHz band (6 GHz band) while protecting the incumbent licensed services that operate in this spectrum. In the 5.925-6.425 GHz and 6.525-6.875 GHz sub-bands the proposed rules will allow unlicensed access points to operate only on frequencies determined by an automated frequency control (AFC) system. In the remainder of the 6 GHz band, the 6.425-6.525 GHz and 6.875-7.125 GHz sub-bands, no AFC system will be required, and the unlicensed access points will be permitted to operate at lower transmitted power. The proposed rules will also permit unlicensed client devices to operate under the control of an access point throughout the 6 GHz band.

**DATES:** Comments are due on or before **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**; reply comments are due on or before **[INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. Written comments on the Paperwork Reduction Act proposed information collection requirements must be submitted by the public, Office of Management and Budget (OMB), and other interested parties on or before **[INSERT DATE 120 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

**ADDRESSES:** You may submit comments, identified by ET Docket No. 18-295 and GN Docket No. 17-183, by any of the following methods;

- *Federal Communications Commission's Web site:* <http://apps.fcc.gov/ecfs>. Follow the instructions for submitting comments.

- *People With Disabilities:* Contact the FCC to request reasonable accommodations (accessible format documents, sign language interpreters, CART, etc.) by email:

FCC504@fcc.gov or phone; 202-4180530 or TTY: 202-418-0432.

For detailed instructions for submitting comments and additional information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document. In addition to filing comments with the Secretary, a copy of any comments on the Paperwork Reduction Act information collection requirements contained herein should be submitted to the Federal Communications Commission via email to PRA@fcc.gov and to Nicole Ongele, Federal Communications Commission, via email to Nicole.Ongele@fcc.gov

**FOR FURTHER INFORMATION CONTACT:** Nicholas Oros, Office of Engineering and Technology, 202-418-0636, Nicholas.Oros@fcc.gov; or Michael Ha, Office of Engineering and Technology, 202-418-2099, Michael.Ha@fcc.gov. For additional information concerning the Paperwork Reduction Act information collection requirements contained in this document, send an email to PRA@fcc.gov or contact Nicole Ongele at (202) 418-2991.

**SUPPLEMENTARY INFORMATION:** This is a summary of the Commission's Notice of Proposed Rulemaking, ET Docket No. 18-295, GN Docket No. 17-183, FCC 18-17, adopted October 23, 2018, and released October 24, 2018. The full text of this document is available for inspection and copying during normal business hours in the FCC Reference Center (Room CY-A257), 445 12th Street SW., Washington, DC 20554. The full text may also be downloaded at: <https://www.fcc.gov/edocs/search-results?t=advanced&fccNo=18-147>. People with Disabilities:

To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an email to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

## **Synopsis**

1. *Discussion.* The rules the Commission proposes for unlicensed use of the 5.925-7.125 GHz band (6 GHz band) are designed to protect important incumbent licensed services that operate in various sub-bands of this spectrum. To do this, the Commission proposes dividing the 6 GHz band into four sub-bands, each based on the prevalence and characteristics of the incumbent services that operate in that spectrum. The 5.925-6.425 GHz and 6.525-6.875 GHz sub-bands are heavily used by point-to-point microwave links, including critical links that must maintain a high level of availability. In these parts of the 6 GHz band, the Commission proposes to permit only “standard-power access points”—using power levels permitted for unlicensed use in the U-NII-1 (5.15-5.25 GHz) and U-NII-3 (5.725-5.85 GHz) bands—to operate only on frequencies determined by an automated frequency control (AFC) system. Other portions of the 6 GHz band, specifically the 6.425-6.525 GHz and 6.875-7.125 GHz sub-bands (totaling 350 megahertz), are used by mobile stations where the locations of the incumbent receivers are not necessarily known or cannot be easily determined from existing databases. Because the lack of location information on mobile stations makes an AFC approach impractical, the Commission proposes to allow only indoor “low-power access point” operation in these sub-bands—using lower, more restricted power levels applicable to operations in the U-NII-2 (5.25-5.35 GHz and 5.47-5.725 GHz) band. The Commission also proposes to permit client devices to operate across the entire 6 GHz band while under the control of either a standard-power access point or a low-power access point. The Commission tentatively concludes that this two-class

approach can expand unlicensed use without causing harmful interference to the incumbent services that will continue to be authorized to use this spectrum.

2. *Unlicensed Operation in the U-NII-5 and U-NII-7 Bands.* The Commission proposes to make the 5.925-6.425 GHz and 6.525-6.875 GHz bands, referenced herein as the U-NII-5 and U-NII-7 bands respectively, available for unlicensed operations under rules consistent with the existing rules for unlicensed device operations in the nearby U-NII-1 and U-NII-3 bands (5.150-5.250 GHz and 5.725-5.850 GHz bands, respectively). Under this proposal, the power levels permitted for the standard-power access points would be the same as the power levels already permitted for unlicensed device operations in the nearby U-NII-1 and U-NII-3 bands. The U-NII-5 and U-NII-7 bands are heavily used for point-to-point fixed links, which support a variety of critical services. The U-NII-5 and U-NII-7 frequencies are also allocated to the fixed-satellite service.

3. The proposed framework for U-NII-5 and U-NII-7 prohibits unlicensed devices from operating co-channel with any fixed link within that link's defined exclusion zone. Thus, for example, if a fixed service receiver is receiving a specific channel, then unlicensed devices operating in the defined exclusion zone of this receiver must use a different channel. The Commission seeks comment on this proposal. Similar to the licensing of new fixed links, which require frequency coordination to protect existing links, the Commission proposes to implement a frequency coordination process for unlicensed devices in these bands to ensure that these new unlicensed devices do not cause harmful interference to fixed service incumbents. Prior to operating in these bands, a standard-power access point would determine or receive a list of permissible operating frequencies and restrict operation to those frequencies. Similarly, client devices would have to obtain a list of permissible operating frequencies from a standard-power access point and restrict operation to those frequencies. The Commission seeks comment on this

proposal. Are there any alternative methods to ensure protection of incumbent services? What are the costs and benefits of any proposed alternative?

4. Additionally, the Commission tentatively concludes that a similar coordination process is not needed to protect incumbent FSS operations because incumbent operations are limited to Earth-to-space transmissions in the 6 GHz band. As such, any interference from unlicensed devices would be experienced at the space station receivers and the particular location of the standard-power access point would in most case have a negligible effect. Since there will be no interference to FSS earth stations, they would not be considered by the AFC system. The Commission seeks comment on this proposal and on whether there would be any benefits in including satellite earth station information in the AFC system at this time.

5. *Determining Permissible Frequencies of Operation.* To determine whether an individual unlicensed device can transmit at a particular location on a given frequency, the Commission proposes that standard-power access points be required to obtain a list of permissible frequencies from an AFC system prior to transmitting or a list of prohibited frequencies in which it cannot transmit. The Commission envisions the AFC system to be a simple database that is easy to implement. The Commission seeks comment on this proposal. What capabilities should be incorporated into the AFC system? Should it be a centralized model where all data and computations are in a central location or the cloud? In this case, the standard-power access point will establish a connection with the AFC system, provide its location and technical details, and the AFC system will communicate the list of permissible frequencies (or a list of prohibited frequencies) back to the standard-power access point. Or should the AFC system's architecture be a de-centralized model where the standard-power access point maintains a local database and performs the necessary computations to determine which frequencies are permissible? Under such a model, how would the local database within the standard-power

access point be kept up to date? What are the trade-offs, including the costs and benefits, between a centralized versus a decentralized model in terms of efficiency, device complexity, and ability to protect fixed service stations?

6. Should the AFC system determine frequency availability using the maximum permissible power for a standard-power access point, or should it determine frequency availability at power levels less than the maximum, and calculate a list of available frequencies and the maximum power permitted on each one? If the AFC system calculates the maximum power for each frequency, how would it control the power levels of standard-power access points to ensure that they operate at permissible levels? How should frequency availability information be reported to standard-power access points? Should the AFC system report availability for discrete frequency bands, e.g., 10 or 20 megahertz channels, or should it simply report the range or ranges of available frequencies? Alternatively, should the AFC simply list the range or ranges of unavailable frequencies?

7. Under a registration requirement, a standard-power access point would transmit identifying information along with its location to the AFC system before receiving a list of permissible channels. Alternatively, a device under a centralized system architecture could provide only its location data and the AFC system would provide it with the list of permissible channels for that location. Under a decentralized system architecture, registration is not necessarily required as the device only needs periodic updates of the local fixed service operating environment.

8. The Commission seeks comment on whether device registration in the AFC database is necessary. What are the advantages and disadvantages of each approach? Would a registration requirement increase cost or complicate design and operations of devices and the AFC? Would a registration requirement be beneficial for determining the source if a fixed

service station were to experience harmful interference? If device registration is required, what information should be provided? Should the information be limited to a device identifier, location, and some basic technical information? Or should device ownership data and contact information also be required? The Commission also seeks comment on how registration information should be entered into the AFC system. Should it be entered manually by a person, such as a professional installer or the equipment user, or should we require automated entry of some or all of the information? The Commission additionally seeks comment on whether there are methods that can be used when a device registers and/or operates to verify its location and operating parameters. For example, could a two-step verification process be used such that registrants must certify as to the accuracy of the information entered into the AFC system?

9. The Commission recognizes that, because licensed use of these bands is not static, the AFC system must be designed to ensure that unlicensed operations protect new and modified licensed operations. The Commission proposes to adopt a requirement that devices periodically verify whether frequency availability has changed. Is a periodic re-check interval the most appropriate method to determine changes in frequency availability information and, if so, what should the maximum permissible interval for verifying frequency availability be? Would an alternative method be more appropriate, such as requiring the AFC system to have the capability to direct devices to change frequencies? Should the Commission adopt a general performance rule instead of specifying a particular re-verification mechanism? The Commission also seeks comment on what should happen when a device and the AFC system are temporarily unable to communicate during the frequency re-verification/update process. Should the Commission, for example, allow the device to temporarily continue operating for a period before requiring it to cease operations?

10. The Commission seeks comment on the types of security requirements that would be necessary for standard-power access points in the U-NII-5 and U-NII-7 bands to ensure that the interference mitigation regime is not thwarted. White space devices and databases, as well as Citizens Broadband Radio Service Devices and the Spectrum Access System, are required to incorporate security measures to ensure that devices communicate only with authorized databases, that all communications and interactions between a database and devices are accurate and secure, and that unauthorized parties cannot access or alter a database or the list of available frequencies sent to a device. They are also subject to requirements that communications between devices and the database, and between different databases, must be secure to prevent corruption or unauthorized interception of data, and that databases be protected from unauthorized data input or alteration of stored data. Are similar requirements necessary or appropriate for devices and the AFC in the U-NII-5 and U-NII-7 bands? Are any additional requirements necessary? Does the Commission need to specify security requirements for devices to ensure that the software within them cannot be easily modified to enable operation on frequencies other than those indicated as available by the AFC system?

11. The Commission proposes to designate multiple entities to operate AFC systems. The Commission seeks comment on this proposal. Should the Commission require that devices have the capability to communicate with all AFC systems or should they only be required to have the capability to communicate with a subset of the designated AFC systems? For example, should a manufacturer be allowed to operate an AFC system that serves only devices that it produces? Should the Commission allow the functions of an AFC system, such as a data repository, registration, and query services, to be divided among multiple entities, or should the Commission require all functions of a single AFC system to be performed by a single entity? Can each AFC system operate autonomously or is there a need for them to communicate any



information with each other? If so, what information would need to be exchanged? Given the potential complexity of multiple AFC system operators needing to coordinate, should the Commission instead designate only a single AFC system operator?

12. The Commission seeks comment on the procedures that should be used to test and validate the capabilities of the AFC and to designate AFC system operators. For example, should the Commission follow procedures similar to those the Office of Engineering and Technology (OET) used for designating white space database administrators? If not, what certification procedure should be implemented? Additionally, the Commission notes that parties have suggested that a multi-stakeholder group could administer AFC system requirements and standards through interaction with AFC system operators. The Commission seeks comment on this suggestion, and on the appropriate mechanism for ensuring Commission oversight of such a multi-stakeholder group.

13. The Commission proposes that an AFC system operator be required to serve for a five-year term which can be renewed by the Commission based on performance during the operating term. The Commission also proposes that if an AFC system ceases operation, the operator provide a minimum of 30-days' notice to the Commission and it transfer its registration data, if registration is required, to another AFC system operator. The Commission seeks comment on these proposals. Are there other functions an AFC system operator should be required to perform?

14. The Commission proposes that an AFC system operator be permitted to charge a fee for providing registration and channel availability functions. The Commission notes that fees could be charged on a transaction basis every time a device is registered or receives an update from an AFC system. The Commission also notes that device manufacturers or a trade association could fund an AFC system as part of its business and that no individual transaction

fees would be charged. The Commission proposes that any of these methods be permitted. Are there other funding mechanisms for AFC systems that should be permitted? What are the costs and benefits of each type of proposed funding mechanism?

15. *Protecting Fixed Service from Harmful Interference.* In general, fixed services use highly directional antennas where the energy transmitted and received is concentrated in a particular direction. This suggests that unlicensed devices need only be excluded from a zone determined by the fixed service receive antenna pattern and the EIRP of the unlicensed device. Using those parameters along with an appropriate propagation model would allow an AFC system to determine an exclusion zone, an area inside of which unlicensed devices would not be able to operate co-channel with fixed service systems. The size of the exclusion zone would be based on the specific interference protection criteria used.

16. The Commission proposes that the AFC system use data from its Universal Licensing System (ULS) to facilitate access by unlicensed devices in the bands that are used for the fixed service. The Commission does not believe it is necessary to propose a mandatory requirement on information collections for the ULS that were previously voluntary in order to increase the efficacy of the AFC system. The Commission notes that licensees have an obligation to keep their information filed with the Commission current and complete. The Commission seeks comment on this proposal.

17. Is there any additional technical data, not currently collected in ULS, that is necessary to facilitate automatic coordination? If so, should that information be collected by the Commission and stored in ULS, or can such supplemental information be reported to and stored in the AFC system? In cases of missing data, how should the AFC operate? Should the Commission establish default values to be used to reach a reasonable assessment with a high degree of confidence that harmful interference will not occur? How should the Commission

handle a situation where harmful interference occurs to a fixed service station due to that station's failure to keep its ULS records up-to-date? Should the unlicensed device be required to switch channels? Should there be any obligation on the fixed service station to update its ULS records before it can seek remedy from the Commission?

18. The Commission seeks comment on how the AFC system should take into consideration temporary fixed operations and/or stations operating under conditional authority which may not be listed ULS. Should the Commission require the operators of temporary fixed and/or stations operating under conditional authority to provide notification of the details of their operations (location, antenna height, antenna pattern, etc.)? Or can those details be reported directly to an AFC? In the latter case, does there need to be a requirement to share such data among AFCs? If so, how would such a sharing system be implemented in a centralized or decentralized AFC system architecture? Are there other methods of protecting temporary fixed operations? Should the AFC system account for filed applications in addition to licensed stations when determining a list of frequencies on which an unlicensed device can operate?

19. The Commission seeks comment on whether to adopt the interference to noise power (I/N ratio) or the ratio of the carrier to interference power (C/I ratio) for specifying the interference protection criteria. The Commission also seeks comment on whether any other metrics could be used for specifying the interference protection criteria. What are the respective costs and benefits of each metric? The interference protection criteria will be used by the AFC system to determine whether a standard-power access point would cause harmful interference to a fixed link receiver. The interference protection criteria the Commission specifies will in effect determine how close co-channel standard-power access points can operate to the fixed link receivers. The Commission seeks comment on the interference protection criteria to adopt.

Commenters are encouraged to provide technical analysis supporting the particular interference protection criteria that they advocate.

20. The Commission does not propose to protect fixed links operating on adjacent channels or second-adjacent channels as FWCC suggests. The Commission invites parties who believe that specific adjacent or second-adjacent channel protection rules be adopted to submit technical showings to support their position.

21. To counteract the effects of fading, FWCC states that licensees design their fixed microwave systems with fade margins of 25-40 dB. The Commission seeks comment on FWCC's characterization of the fade margin. What are the typical design criteria for fixed service station fade margins? The Commission also seeks comment on whether and specifically how fading might affect the levels of the potentially interfering signal being transmitted from unlicensed devices. Given that atmospheric conditions affect multipath fading, should the interference protection criteria be relaxed or other allowances made in areas where fades are not as prominent? How might this be accomplished? Should the Commission consider the time of day fading occurs in conjunction with the relative busy hours for unlicensed traffic when determining the interference protection criteria? To what degree? Given that the loss of synchronization can occur even without the presence of any interference, can such events be attributed to atmospheric multipath fading? Given the diurnal and seasonal nature of atmospheric multipath fading, are there mitigation strategies that can take advantage of this phenomenon to ensure the potential for causing harmful interference is minimized?

22. Several different propagation models can be used to determine the appropriate exclusion zones. The Commission believes that in the first kilometer, an effective propagation model should include clutter loss in addition to both line-of-sight and non-line-of-sight conditions. Beyond the first kilometer, the propagation model should include a combination of a

terrain-based path loss model and a clutter loss model appropriate for the environment. The Commission seeks comment on this approach, as well as the appropriate propagation models for this application. Can some of the propagation models for different conditions be combined into a single model? Is using curve fitting to combine propagation models of different ranges of applicability into a single model an appropriate approach for this application? What are the costs and benefits of each propagation model? What other factors should be considered when choosing an appropriate propagation model?

23. If expressed in terms of latitude, longitude, and height, what is the required accuracy of the location of each standard-power access point to ensure fixed service protection? Rather than requiring a certain location accuracy for a standard-power access point, would it be more appropriate to assign an area of uncertainty around the computed location, based on the underlying technology and propagation environment, and then build the necessary processing into the AFC system to adjust its separation distance between the standard-power access point and fixed service receiver based on the area of uncertainty? If so, who will determine such an assignment and how, particularly with respect to indoor deployment? How will the location accuracy information be shared with the AFC? Will it be part of the registration process? What are the costs and benefits of any proposed alternative?

24. The typical installation height above ground of a standard-power access points should probably range from 5 meters to 30 meters. The Commission seeks comment on whether this estimate of typical standard-power access point heights is appropriate. The Commission seeks comment on whether to limit the maximum installation height of outdoor standard-power access points. If so, should that limit be set to 30 meters? Because frequency availability will depend on the height of standard-power access points, will the AFC system inherently address this matter by limiting the availability of permissible frequencies?

25. The Commission seeks comment on requiring that every standard-power access point be professionally installed. If the Commission requires professional installation, what mechanisms should be in place to ensure that a non-professional or unlicensed person cannot perform an installation? Should the Commission rely on an industry-led process to develop professional installer accreditation standards as the Commission has done in similar situations? Should AFC system(s) be required to take steps to ensure that only standard-power access points that have been professionally installed can receive a list of frequencies upon which to operate? If the Commission adopts a professional installation requirement, should it exempt certain access points that are less likely to cause interference such as, for example, those installed indoors or that are below a specified height? Are there other measurement/geolocation tools, existing or on the horizon, that can complement GPS? If so, can they be used in lieu of professional installation? Should the Commission require that geolocation capability be built into the standard-power access points? Are there other means of obtaining location information, such as street address and floor number? If so, how will this impact the contour calculations? What are the costs and benefits of any proposed alternative?

26. The Commission proposes to require client devices that operate in the U-NII-5 and U-NII-7 bands to be under the control of a standard-power access point. Notwithstanding this proposal, the Commission seeks comment on whether client devices should be allowed to transmit probe requests, consistent with 802.11 standard, as means for joining a network, prior to receiving a frequency assignment. If so, is there any way to allow such use without causing harmful interference to the incumbent users? The Commission seeks comment on what assumptions to make about the area in which a client device can operate.

27. The Commission seeks comment on the typical or maximum operating radius for communications between a client device and a standard-power access point. How should the

distance be incorporated into any frequency coordination computation to ensure incumbents are protected? The Commission's proposed rules define a client device as "a U-NII device whose transmissions are generally under the control of an access point and that is not capable of initiating a network." The Commission seeks comment on this definition

28. *Preventing Aggregate Interference to Operations in the Fixed-Satellite Service.*

The Commission tentatively concludes that use of the AFC is not necessary to protect satellite receivers and that limits on radiated power will prevent interference to space station receivers from individual unlicensed devices. The Commission seeks comment on whether a restriction on pointing toward the geostationary arc would be appropriate. The Commission seeks comment on the potential for the satellite receivers in the U-NII-5 and U-NII-7 bands to receive harmful aggregate interference due to transmissions from unlicensed devices operating in these bands. The Commission also seeks comment on methods that could be used to monitor aggregate interference to satellite receivers and potential remediation techniques in the event that such aggregate interference reaches levels that would require action. In this respect, the Commission asks about the feasibility of developing monitoring techniques that would be agreeable for all parties involved and whether there is any role that unlicensed users could play with regard to such monitoring.

29. No earth stations are currently licensed to use the space-to-Earth allocation in the 6.7-6.875 GHz portion of the U-NII-7 band. If this spectrum is used for space-to-Earth links in the future, the Commission proposes that the AFC system could be used to prevent harmful interference to the earth station receivers by excluding standard-power access point from operating in this spectrum near the associated earth stations. The Commission seeks comment on how the AFC system might be used to protect any future receiving satellite earth stations. In

particular, the Commission asks what interference protection criteria and propagation models might be appropriate

30. *Lower Power Indoor Unlicensed Devices in the U-NII-6 and U-NII-8 Bands.* The Commission proposes to allow unlicensed devices to operate in the 6.425-6.525 GHz and 6.875-7.125 GHz bands, referenced herein as the U-NII-6 and U-NII-8 bands respectively, under two specific conditions: (1) Unlicensed devices are limited to the lower power levels applicable to unlicensed operations in the U-NII-2 bands and (2) such devices are restricted to indoor operation.

31. Many incumbents in the U-NII-6 and U-NII-8 bands conduct mobile operations. Because exclusion zone calculations require knowledge of the incumbent receiver location and antenna orientation, the Commission does not believe that an AFC system would be feasible in these bands. Instead, the Commission proposes technical rules for unlicensed devices designed to minimize the potential harmful interference to incumbent operations in these bands. By restricting such devices to low power, indoor use, the Commission anticipates that incumbent licensed services would be protected from harmful interference, in part due to significant building attenuation and clutter losses for transmissions originating from indoor devices. The Commission recognizes that its assessment that there is a low likelihood that indoor low power devices will cause harmful interference depends in part on the assumptions that are made with respect to the number and density of these devices and assumptions about the incumbent services interference protections. The Commission proposes to adopt power limits that are based on the existing rules in the U-NII-2C band (5.47-5.725 GHz).

32. The Commission seeks comment on the compatibility between unlicensed indoor low power devices and Low Power Auxiliary Station services which may operate indoors in the U-NII-8 band. Commenters should provide all study assumptions, including appropriate



propagation models, availability requirements, receiver sensitivity, noise figure, antenna patterns, and fade margins, between indoor low power unlicensed devices anticipated under our proposals and mobile and fixed links in these bands. The Commission believes the same conditions that protect incumbents from harmful interference from a single U-NII device will also protect those same incumbents from aggregate interference. Nevertheless, the Commission requests that commenters address this assumption. The Commission encourages parties to employ statistical models to evaluate the risk of harmful interference.

33. Given the uncertainties inherent in establishing mobile links and the attenuation of the signals due to building and clutter losses, the Commission anticipates that low-power indoor operation will not increase the risk of harmful interference to mobile service incumbents. The Commission seeks comment on this assessment. The Commission seeks comment on factors that it has not accounted for in this analysis, including more detailed information on the specific mobile deployment configurations in these bands. Are Cable Television Relay Service and TV pickup mobile station deployment configurations largely similar? Are receive sites for the TV pickup and Cable Television Relay Service mobile assignments typically deployed at fixed locations? What are the typical fade margins for mobile links and what types of service are these fade margins required for? For the approximately 200 public safety or business/industrial pool assignments in these bands, do they operate on a mobile basis or are they temporarily fixed for longer periods of time when in use? How many mobile stations are typically associated with an assignment?

34. The Commission seeks comment on whether requirements for the various fixed services in the U-NII-6 and U-NII-8 bands differ. For example, do Broadcast Auxiliary Service point-to-point links have the same design criteria regarding availability and fade margins as Private Operational Fixed public safety and business/industrial pool links or common carrier

point-to-point links? Fixed Service commenters have raised the possibility of indoor unlicensed devices in tall buildings causing unacceptable degradation to the fade margin of a fixed service link. Under what conditions would such interference occur? How do these design criteria for fixed service links in these bands relate to the potential for such interference? Are there mitigation strategies that will reduce the potential for unlicensed devices to cause harmful interference under these conditions? Would unlicensed device operation in these bands have any detrimental effect on Broadcast Auxiliary Service operations, which are characterized by transmitting to strategically located receive sites?

35. The Commission believes that the technical characteristics proposed for indoor low-power access points in the U-NII-6 and U-NII-8 bands will protect the FSS and that additional interference mitigation techniques are unnecessary. Because of the low power and low probability that an indoor unlicensed device will have a direct line of sight with Sirius/XM satellites, the Commission believes the risk of causing harmful interference to those satellites is low. Regarding the limited number of MSS feeder downlinks in the U-NII-8 band, the Commission tentatively concludes that MSS operations will be similarly protected by the limitations on unlicensed use proposed in this Notice, particularly given the small number and isolated nature of these locations. The Commission seeks comment on these tentative conclusions, and on whether any additional mitigation techniques might be necessary to protect satellite services in these bands.

36. The Commission proposes to restrict operation of unlicensed devices in the U-NII-6 and U-NII-8 bands to indoor operation. Broadcasters covering large venues such as sporting events and political conventions rely on the U-NII-6 and U-NII-8 bands for operations that may take place indoors. Are there additional low-power device restrictions that the Commission should consider to prevent interference to broadcaster indoor operations in these

bands? The Commission also proposes to require client devices that operate in the U-NII-6 and U-NII-8 bands to be under the control of low-power access point. This requirement will help prevent uncontrolled outdoor operation of client devices.

37. The Commission believes that in most cases Broadcast Auxiliary Service operations will be between a mobile transmitter and a fixed location to which it will have a direct line of sight. ITU models give values for both building entry and clutter losses with some probability of occurrence. The Commission notes that the ITU model shows a median building entry losses of approximately 18 dB for traditional construction and 30 dB for thermally efficient construction for horizontal incidence, with increasing building entry losses at larger elevation angles. Are assumptions for building entry losses and clutter loss enough to overcome concerns of interference even when the unlicensed device might be in the main beam of the receiver? Are there other factors or models that should be considered when evaluating losses between indoor unlicensed devices and U-NII-6 and U-NII-8 incumbent services?

38. The Commission also invites comment on how the Commission could ensure that low-power access points are restricted to indoor use. Should the Commission adopt a requirement that indoor devices have direct connection to a power outlet? Are there other methods or equipment form-factors that would discourage outdoor usage of low-power access point unlicensed devices that the Commission should consider? For example, noting that GPS signals generally do not penetrate very far into buildings, would it be feasible and cost effective to require low-power access points to monitor GPS satellite signals and to cease transmissions if a GPS signal is detected? Would it be better to set a GPS signal threshold rather than a detection threshold above which a low-power access point would be required to shut off to differentiate between clear-sky (outdoor) GPS satellite view and indoor detection? The Commission seeks comment on this and other methods of ensuring devices operate in accordance with the indoor-

only restriction. Finally, given that client devices are even lower power (5 mW/MHz EIRP) and are required to only operate in the U-NII-6 and U-NII-8 bands after receiving an authorization from a low-power access point, are there any other considerations the Commission needs to take into account to ensure these devices do not cause harmful interference to incumbent operations?

39. The Commission does not propose to make changes to existing provisions in Part 15 for unlicensed wideband and ultra-wideband systems as the Commission expects such systems will continue to coexist with all other systems, both licensed and unlicensed, within the 6 GHz band. The Commission seeks comment from interested parties regarding the potential effect of our proposals on their existing unlicensed devices and use models. To the extent that parties believe new devices could adversely affect existing operations, they should suggest specific rules and mitigation strategies that would minimize such risk.

40. *Other Unlicensed Operation Options.* The Commission seeks comment on whether we should allow indoor low-power access point operations in the U-NII-5 and U-NII-7 bands under the same conditions as proposed for the U-NII-6 and U-NII-8 bands; *i.e.*, low power, indoor-only use without the need for authorization from an AFC system. If so, what power level could be permitted for such operation without increasing the risk of harmful interference to licensed services? Are there any other operational requirements, rules or mitigation techniques that would allow low-power access points to operate in the U-NII-5 and U-NII-7 bands without the use of an AFC system?

41. The Commission seeks comment on whether there are any ways to protect incumbent mobile operations, if the Commission were to allow unlicensed operations in the U-NII-6 or U-NII-8 bands at the same power levels as those proposed for U-NII-5 and U-NII-7 bands, both indoors and outdoors. Are a significant number of Broadcast Auxiliary Service and Cable Television Relay Service receive sites fixed, such that they could be protected by the AFC

in the same fashion as fixed operations? Do fixed receive sites associated with mobile operations typically use fixed antennas or steerable antennas and could a protection contour be defined around a fixed receive site taking into consideration the characteristics of the receive antenna? Is it possible, for example, to dynamically update the permissible frequency list whenever mobile sites become active or when the information for these sites becomes available? Can push notifications serve as a means of informing affected standard-power access points that the permissible frequency list must be updated to protect the incumbents? Additionally, would the Commission's tentative conclusions regarding protections of satellite services in the U-NII-6 and U-NII-8 bands be undermined by permitting high power unlicensed operations in these bands?

42. The Commission seeks comment on whether unlicensed devices in the U-NII-5 and U-NII-7 bands should be explicitly permitted to operate either as a mobile hotspot or as a transportable device. As with fixed access points in these bands, such operation would be under the control of an AFC system. Is such operation feasible under such a condition? Are there rules we can put in place to permit such operation while still ensuring that licensed services are protected from harmful interference? For example, the rules for Mode II personal/portable white space devices allow them to load channel availability information for multiple locations to define a geographic area in which the device can operate. Could a similar mechanism work in these bands? Are there specific capabilities that need to be included in the AFC to enable such operation? Should such operation be restricted to certain power levels? Are there other safeguards that could be implemented to permit such operation?

43. *Power Limits.* Based on the experience of the existing U-NII bands, the Commission believes these levels will provide the proper balance between allowing flexibility

for unlicensed devices to deploy while still protecting incumbent systems. Therefore, the Commission proposes maximum EIRP power spectral density limits of:

- For U-NII-5 and U-NII-7 standard-power access points, the maximum conducted output power is 1 watt and maximum power spectral density is 17 dBm in any 1 megahertz band. If a transmitting antenna with directional gain greater than 6 dBi is used, the maximum power and power spectral density shall be reduced by the amount in dBi that the directional gain is greater than 6 dBi.
- For U-NII-6 and U-NII-8 band low-power access points, the maximum conducted output power is 250 milliwatts and maximum power spectral density is 11 dBm in any 1 megahertz band. If a transmitting antenna with directional gain greater than 6 dBi is used, the maximum power and power spectral density shall be reduced by the amount in dBi that the directional gain is greater than 6 dBi.
- For client devices, the maximum conducted output power is 63 milliwatts and maximum power spectral density is 5 dBm in any 1 megahertz band. If a transmitting antenna with directional gain greater than 6 dBi is used, the maximum power and power spectral density shall be reduced by the amount in dBi that the directional gain is greater than 6 dBi.

44. The Commission seeks comment on these proposed power limits. The Commission also seeks comment on whether higher power operations could be permitted in rural and underserved areas under certain conditions. If so, should such operations be limited to only the U-NII-5 and U-NII-7 bands and only under the control of an AFC system? Commenters advocating for higher power should also address how much more power they believe is necessary to serve these areas and provide comment on how to define rural and underserved areas in this context. Additionally, commenters should address whether such operations should

be limited to point-to-point operations (possibly with a minimum antenna gain) or if point-to-multipoint operations should be permitted.

45. The Commission also seeks comment on whether to adopt power rules that are structured differently than the existing U-NII rules. For example, the Commission could specify only a radiated power spectral density limit or a combination of a radiated maximum power and a radiated power spectral density limit. What are the benefits and drawbacks of each approach as it relates to equipment design and cost as well as maximizing the area over which unlicensed devices can operate and ensuring incumbents are protected from harmful interference? Should the Commission specify a maximum transmit power based on a 20 megahertz channel bandwidth in addition to the power and power spectral density limits described above? What are the benefits of such an approach? Would such a rule unnecessarily restrict devices to less efficient operational modes? Should certain types of transmitters that employ electrically steerable, MIMO, or phased array antennas have special rules which allow the device to operate with higher power levels?

46. Additionally, the Commission seeks comment on our proposal to reduce the permitted transmitted power and power spectral density when using antennas with a directional gain greater than 6 dBi. Should the Commission require that antennas be integrated with the device or can the Commission permit users to choose an appropriate antenna for their application? If antennas are not integrated with the device, should an equipment authorization grantee be required to maintain a list of permissible antennas with its equipment authorization or in the manual or on a website? What effect will our proposal have on the equipment authorization process?

47. *Unwanted Emissions Limits.* The Commission proposes that for all unlicensed devices operating in the 6 GHz band under the proposals herein, all emissions below 5.925 GHz

and above 7.125 GHz shall not exceed an EIRP of -27 dBm/MHz. The Commission seeks comment on this proposal. In addition, the Commission seeks comment on the need to specify out-of-band emission limits between the sub-bands of the 6 GHz band—i.e. between the U-NII-5, U-NII-6, U-NII-7 and U-NII-8 bands? What are the appropriate emission limits? The Commission also seeks comment on the transmit emission mask that unlicensed devices should be required to meet to protect incumbent services operating on adjacent frequencies within the band. Is the emission mask suggested by RKF Engineering in the technical study submitted by Apple Inc., Broadcom Corporation, et al. appropriate for this purpose? If not, what is the appropriate emission mask?

48. *Prohibition on use in Moving Vehicles and Drones.* The Commission proposes that unlicensed access points (both standard-power access point and low-power access point) be prohibited from operating in moving vehicles such as cars, trains, or aircraft. The Commission is especially concerned about the interference consequences of allowing operation onboard aircraft because the longer line-of-sight distances from devices at typical aircraft altitude could result in interference over a wide area. The Commission seeks comment on this proposal and whether there are alternative, feasible proposals to use the band for moving vehicles. The Commission also propose that unlicensed devices, whether a standard-power access point, low-power access point, or client device, operating under these rules not be permitted for use with unmanned aircraft systems. The Commission seeks comment on this proposal.

49. *Additional Mitigation Measures.* Although the Commission believes that unlicensed device operation as discussed herein will not result in harmful interference to licensed services, the Commission nonetheless ask whether any additional requirements are necessary to ensure that any instances of harmful interference that may occur can be resolved expeditiously.



50. The Commission seeks comment on whether to require standard-power access points in these bands to transmit digital identifying information. If so, should such a requirement be applied in all instances (standard-power access points and low-power access points and their associated client devices)? If, as proposed, low-power access point operation would be restricted to indoors and such devices would not have any identifying information in the AFC database, would there be any practical benefit to requiring low-power access points to transmit digitally identifying information? Would a specific format for such information need to be specified and would there be a need for specialized equipment to detect and decode the identifying information? If so, could this function be easily incorporated into new equipment or retrofitted to existing equipment? How much would adding this capability into equipment cost?

51. As an additional means to locate the source of harmful interference, the Commission could require that the AFC record the actual frequency being used by each standard-power access point. This information could be useful for locating interference sources if it can be collected from every standard-power access point and stored in a relational database. The Commission seeks comment on this tool and other means for remediation of interference.

52. The Commission seeks comment on whether it would be necessary to institute an interference resolution process beyond the existing rule for unlicensed devices. For example, would it be necessary to establish an interference detection and identification procedure? If so, who will develop this procedure and who will be responsible for exercising it? Should the AFC system operator(s) be responsible for this task?

53. The Commission seeks comment on requiring manufacturers to provide consumers with information on any specific operational requirements applicable to devices operating in the U-NII-5 through U-NII-8 bands to prevent harmful interference. How should this information be conveyed, e.g., by device labeling or in the user's manual, and what

information should be provided? Depending on the types of operational requirements that the Commission adopts, examples of information that could be provided include that certain devices may be operated only indoors, may not be operated on board aircraft, require professional installation, or must update their location information with an AFC system when installed at a new location.

54. *Procedural Matters. Paperwork Reduction Act Analysis.* This document contains proposed new or modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

55. *Initial Regulatory Flexibility Analysis.* As required by the Regulatory Flexibility Act, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities of the proposals addressed in this document. The IRFA is Appendix C of the Notice of Proposed Rulemaking, which can be obtained as described above. We request written public comment on the IRFA. Comments must be filed in accordance with the same filing deadlines as comments filed in response to the NPRM and must have a separate and distinct heading designating them as responses to the IRFA. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of this Notice, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with the Regulatory Flexibility Act.

56. *Filing Requirements.* Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 CFR 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <http://apps.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12<sup>th</sup> St., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of *before* entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12<sup>th</sup> Street, SW, Washington DC 20554.

57. *People with Disabilities.* To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

58. *Availability of Documents.* Comments, reply comments, and ex parte submissions will be publicly available online via ECFS. These documents will also be available for public inspection during regular business hours in the FCC Reference Information Center, which is located in Room CY-A257 at FCC Headquarters, 445 12th Street, SW, Washington, DC 20554. The Reference Information Center is open to the public Monday through Thursday from 8:00 a.m. to 4:30 p.m. and Friday from 8:00 a.m. to 11:30 a.m.

59. *Ex Parte Presentations.* The proceedings shall be treated as “permit-but-disclose” proceedings in accordance with the Commission’s *ex parte* rules. Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter’s written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and

must be filed consistent with rule 1.1206(b). In proceedings governed by rule 1.49(f) or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in these proceeding should familiarize themselves with the Commission's *ex parte* rules.

## **I. ORDERING CLAUSES**

60. IT IS ORDERED, pursuant to the authority found in Sections 4(i), 201, 302, and 303 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 201, 302a, 303, and § 1.411 of the Commission's Rules, 47 CFR 1.411, that this *Notice of Proposed Rulemaking* IS HEREBY ADOPTED.

61. IT IS ORDERED that NOTICE IS HEREBY GIVEN of the proposed regulatory changes described in this *Notice of Proposed Rulemaking*, and that comment is sought on these proposals.

62. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Notice of Proposed Rulemaking*, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

**List of Subjects in 47 CFR part 15**

Communications equipment, Radio.

FEDERAL COMMUNICATIONS COMMISSION

**Katura Jackson,**

*Federal Register Liaison Officer,*

*Office of the Secretary.*

## Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR part 15 as follows:

### PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation for part 15 continues to read as follows:

**Authority:** 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544a, and 549.

2. Revise § 15.401 to read as follows:

#### § 15.401 Scope.

This subpart sets out the regulations for unlicensed National Information Infrastructure (U-NII) devices operating in the 5.15-5.35 GHz, 5.47-5.725 GHz, 5.725-5.85 GHz, 5.925-6.425 GHz, 6.425-6.525 GHz, 6.525-6.875 GHz, and 6.875-7.125 GHz bands.

3. Amend § 15.403 by:
  - a. Redesignating paragraphs (f) through (s) as paragraphs (h) through (u);
  - b. Redesignating paragraphs (b) through (e) as paragraphs (c) through (f); and
  - c. Adding new paragraphs (b) and (g).

The additions read as follows:

#### § 15.403 Definitions.

\* \* \* \* \*

(b) *Automated Frequency Coordination (AFC)* is a system that automatically determines and provides lists of which frequencies are available for use by access points operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands.

\* \* \* \* \*

(g) *Client Device.* A U-NII device whose transmissions are generally under the control of an access point and that is not capable of initiating a network.

\* \* \* \* \*

4. Amend § 15.407 by:

- a. Redesignating paragraphs (a)(4) and (5) as paragraphs (a)(7) and (8);
- b. Adding new paragraphs (a)(4) through (6);
- c. Revising newly redesignated paragraph (a)(8)
- d. Redesignating paragraphs (b)(5) through (8) as paragraphs (b)(6) through (9);
- e. Adding new paragraph (b)(5);
- f. Revising paragraph (d); and
- g. Adding paragraph (k).

The revisions and additions read as follows:

**§ 15.407 General technical requirements.**

(a) \* \* \*

(4) For an access point operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed 1 W, provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(5) For an access point operating in the 6.425-6.525 GHz, and 6.875-7.125 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW, provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output



power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) For client devices in the 5.925-6.425 GHz, 6.425-6.525 GHz, 6.525-6.875 GHz, and 6.875-7.125 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed 63 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 5 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

\* \* \* \* \*

(8) The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made for a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, 5.47-5.725 GHz, 5.925-6.425 GHz, 6.425-6.525 GHz, 6.525-6.875 GHz, and 6.875-7.125 GHz bands are made for a reference bandwidth of 1 megahertz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

(b) \* \* \*

(5) For transmitters operating within the 5.925-7.125 GHz band: All emissions outside of the 5.925-7.125 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

\* \* \* \* \*

(d) *Operational restrictions.* (1) Operation of access points in the 5.925-6.425 GHz, 6.425-6.525 GHz, 6.525-6.875 GHz and 6.875-7.125 GHz bands is prohibited in moving vehicles such as cars, trains, and aircraft.

(2) Operation in the 5.925-6.425 GHz, 6.425-6.525 GHz, 6.525-6.875 GHz and 6.875-7.125 GHz bands is prohibited for control of or communications with unmanned aircraft systems.

(3) Operation in the 6.425-6.525 GHz and 6.875-7.125 GHz bands is limited to indoor locations.

\* \* \* \* \*

(k) *Automated frequency coordination (AFC).* (1) Access points operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands shall access an AFC system to determine the available frequencies at their geographic coordinates prior to transmitting. Access points may transmit only on frequencies indicated as being available by an AFC system.

(2) An AFC system shall obtain information on protected services within the 5.925-6.425 GHz and 6.525-6.875 GHz bands from Commission databases and use that information to determine frequency availability for access points based on protection criteria specified by the Commission.

(3) An AFC system operator will be designated for a five-year term which can be renewed by the Commission based on the operator's performance during the term. If an AFC system ceases operation, it must provide at least 30-days' notice to the Commission and transfer any registration data to another AFC system operator.

(4) An AFC system operator may charge fees for providing registration and channel availability functions.

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